

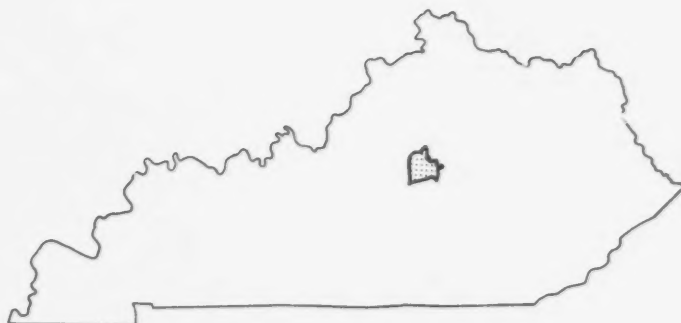
AUG 06 1988

FEM 1209:210306

FLOOD INSURANCE STUDY



**MERCER COUNTY,
KENTUCKY**
UNINCORPORATED AREAS



OCTOBER 18, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER - 210306



NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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FLOOD INSURANCE STUDY

MERCER COUNTY, UNINCORPORATED AREAS, KENTUCKY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Mercer County, Kentucky, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the Kentucky River were obtained from the Flood Insurance Studies for Woodford and Jessamine Counties, Kentucky (References 1 and 2).

The hydrologic and hydraulic analyses for the Chaplin River were performed by the U.S. Geological Survey (USGS) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823. This study was completed in July 1980.

1.3 Coordination

On September 23, 1987, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, the community, and FEMA.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Mercer County, Kentucky. The area of study is shown on the Vicinity Map (Figure 1). The incorporated areas within the county were excluded from this study.

Flooding caused by overflow of the Chaplin and Kentucky Rivers was studied in detail.

Areas having low development potential or minimal flood hazards were previously studied using approximate analyses. The results were shown on the Flood Hazard Boundary Map for Mercer County, Kentucky (Reference 3) and are incorporated into this Flood Insurance Study.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through July 1991. The scope and methods of study were proposed to and agreed upon by FEMA and Mercer County.

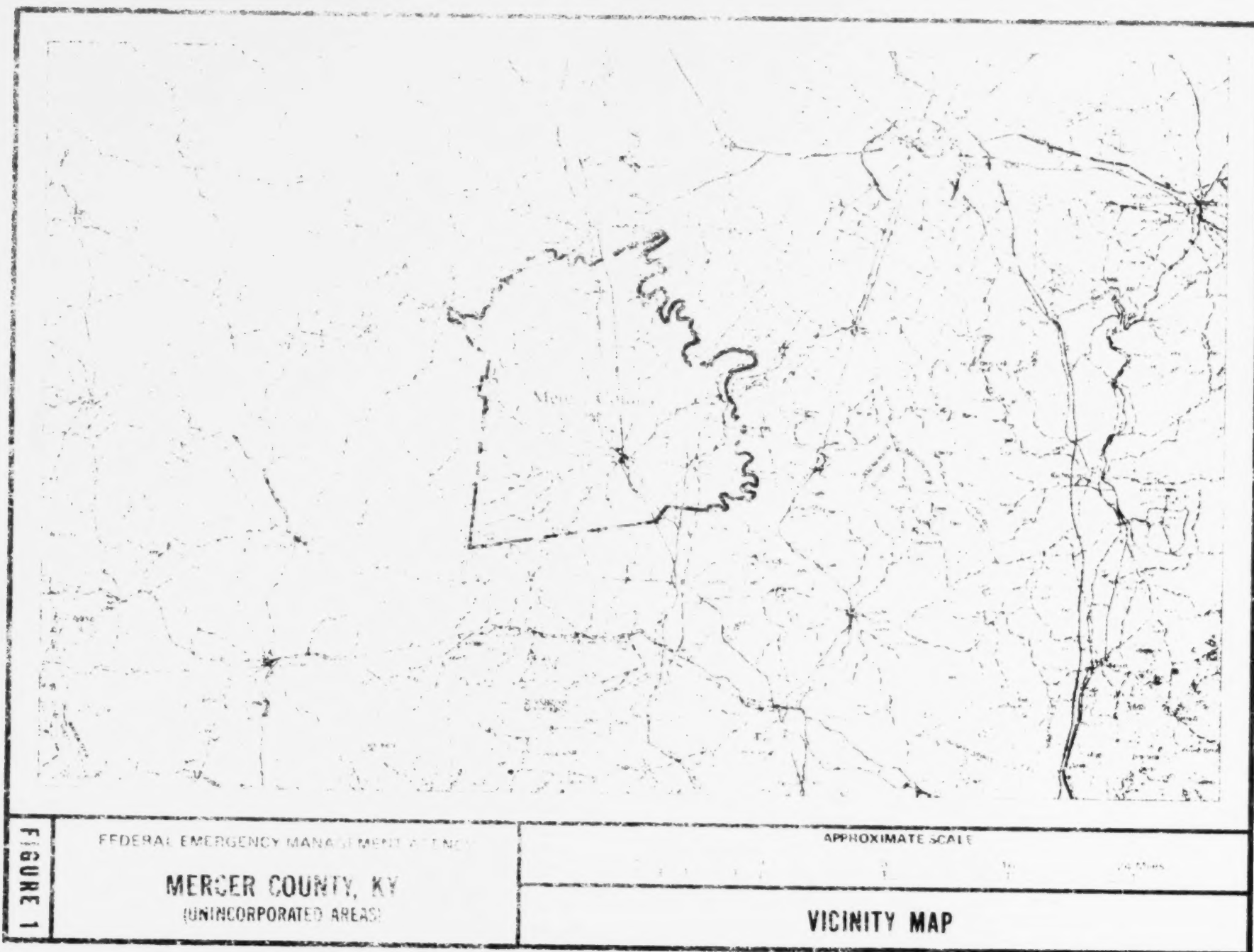
2.2 Community Description

Mercer County is in central Kentucky, approximately 26 miles southwest of the City of Lexington. Mercer County is bordered by Anderson County on the north, Washington County on the west, Boyle County on the south, and Woodford, Jessamine, and Garrard Counties on the east. Mercer County is served by U.S. Routes 68 and 127 and State Routes 33, 152, 390, 1160, 1988, and 1989. The county is also served by the Norfolk Southern Railway. The 1980 population of Mercer County was reported to be 19,011 (Reference 4).

2.3 Principal Flood Problems

According to local residents, the 1978 flood is the highest of record on the Chaplin River. No previous reports or high-water profiles exist for the area, but based on high-water marks, the 1978 flood has an estimated recurrence interval of 10 years. Only a few dwellings around Cornishville, Kentucky, were affected.

On the Kentucky River, the January 1937 flood is the highest flood of record, with a recurrence interval of approximately 45 years at Kentucky River Lock 6 and a recurrence interval in excess of 100 years at Lock 4. These frequencies are based on natural conditions. The most recent flood of major proportion occurred in April 1972, and had a recurrence interval of approximately 25 years.



2.4 Flood Protection Measures

Buckhorn Lake, located about 43.3 miles above the mouth of the Middle Fork Kentucky River; and Carr Fork Lake, located about 8.8 miles above the mouth of Carr Fork, which is a tributary to the North Fork Kentucky River, presently reduce flooding on the Kentucky River by an average of approximately 1.5 feet for major floods. No other flood protection measures are known to exist within the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

The 100-year discharge for the Chaplin River was determined using USGS flood frequency techniques (Reference 5). Drainage areas were determined from topographic maps (Reference 6) and information from a USGS Report (Reference 7). No adjustments for urbanization were used in the analyses.

The 10-, 50-, 100-, and 500-year floodflow frequency data for the Kentucky River were based on a study of all USGS gaging stations on the river (Reference 8).

Peak discharge-drainage area relationships for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

<u>FLOODING SOURCE AND LOCATION</u>	<u>DRAINAGE AREA (SQ. MILES)</u>	<u>PEAK DISCHARGE (CFS)</u>			
		<u>10-YEAR</u>	<u>50-YEAR</u>	<u>100-YEAR</u>	<u>500-YEAR</u>
CHAPLIN RIVER					
at State Highway 1941	146.4	N/A	N/A	28,500	N/A
at Cornishville Road	144.4	N/A	N/A	28,300	N/A
just upstream of confluence of Hayden Creek	137.4	N/A	N/A	27,400	N/A
KENTUCKY RIVER					
at Lock 6 (Salvisa)	5,102	91,000	109,200	115,200	127,400
at Lock 8 (Camp Nelson)	4,414	87,200	103,300	109,200	120,500

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Cross sections and dimensions of backwater-producing structures were obtained by field survey.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles and on the Flood Insurance Rate Map.

Roughness coefficients (Manning's "n") for the Chaplin River were obtained by field survey and adjusted based on stereo photographs and Water Supply Paper 1849 (Reference 9). Roughness values averaged 0.045 for the main channel and 0.065 for the overbank areas.

Roughness coefficients for the Kentucky River were determined by reproducing the high-water marks for the April 1972 flood. Coefficients averaged 0.042 for the channel and 0.070 for the overbank areas.

Starting water-surface elevations for the Chaplin River were computed using the slope-conveyance method. On the Kentucky River, starting water-surface elevations were based on an established stage-discharge relationship at Lock 4, at Frankfort, Kentucky, downstream of Mercer County. Water-surface elevations for floods of the selected recurrence intervals on the Kentucky River were computed using the HEC-2 computer program (Reference 10).

The computer program WSFPRO was used to compute the 100-year water surface profile for the Chaplin River (Reference 11).

Flood profiles were drawn showing the computed water-surface elevation for floods of the selected recurrence intervals. In cases where the 75- and 100-year flood elevations are close together, due to limitations of the profile scale, only the 100-year profile has been shown.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used by this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:4000 with a contour interval of 20 feet (Reference 6).

The 100-year floodplain boundary is shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, A-1, A-2, AO, A99, B, B-1, V1). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and a lack of detailed topographic data.

For the streams studied by approximate methods on the 15-200, floodplain boundary was delineated using the Flood Insurance Rate Map for Mercer County (Reference 3).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases the flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2, Floodway Data. The computed floodways are shown on the Flood Insurance Rate Map. In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway for the Kentucky River lie outside the county boundary.

Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause more than a 1.0-foot increase in the base flood elevations at any point within the community.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC)	REGULATORY (FEET NGVD)	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE (FEET)
KENTUCKY RIVER								
A	91.9	416	19,847	5.8	528.2	528.2	529.2	1.0
B	93.4	498	23,848	4.8	529.6	529.6	530.5	0.9
C	95.9	523	24,755	4.7	531.8	531.8	532.7	0.9
D	96.6	519	20,933	5.5	531.8	531.8	532.7	0.9
E	100.2	450	21,567	5.3	535.1	535.1	536.0	0.9
F	102.3	457	23,446	4.9	537.1	537.1	538.0	0.9
G	105.0	476	23,451	4.9	538.4	538.4	539.3	0.9
H	107.2	342	18,414	6.3	539.9	539.9	540.9	1.0
I	109.5	403	21,111	5.5	542.1	542.1	543.1	1.0
J	111.4	460	21,137	5.5	543.6	543.6	544.6	1.0
K	113.2	453	22,843	5.0	545.2	545.2	546.2	1.0
L	114.0	398	21,695	5.3	545.7	545.7	546.7	1.0
M	114.6	472	24,299	4.7	546.2	546.2	547.2	1.0
N	115.9	478	22,608	5.1	547.0	547.0	548.0	1.0
O	116.6	447	23,101	5.0	547.6	547.6	548.5	0.9
P	117.2	509	20,988	5.5	548.0	548.0	548.9	0.9
Q	117.9	440	22,146	5.2	548.7	548.7	549.7	1.0

*MILES ABOVE MOUTH

*THIS WIDTH EXTENDS BEYOND THE COUNTY BOUNDARY

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

MERCER COUNTY, KY
(UNINCORPORATED AREAS)

FLOODWAY DATA

KENTUCKY RIVER

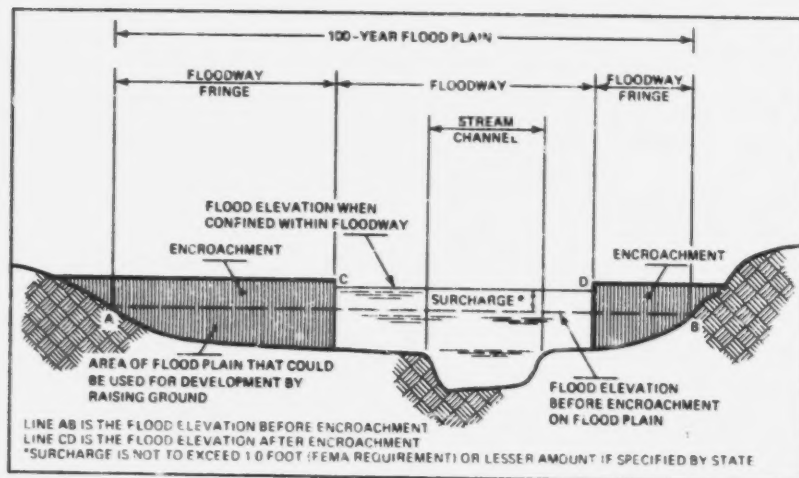


Figure 2 - Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average

depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

Flood Insurance Studies published for Woodford and Jessamine Counties, Kentucky (References 1 and 2) are in agreement with this study. Flood Insurance Rate Maps printed for the Cities of Burgin and Harrodsburg, Kentucky (References 12 and 13) are also in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for Mercer County (Reference 3).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 1371 Peachtree Street, NE, Suite 736, Atlanta, Georgia 30309.

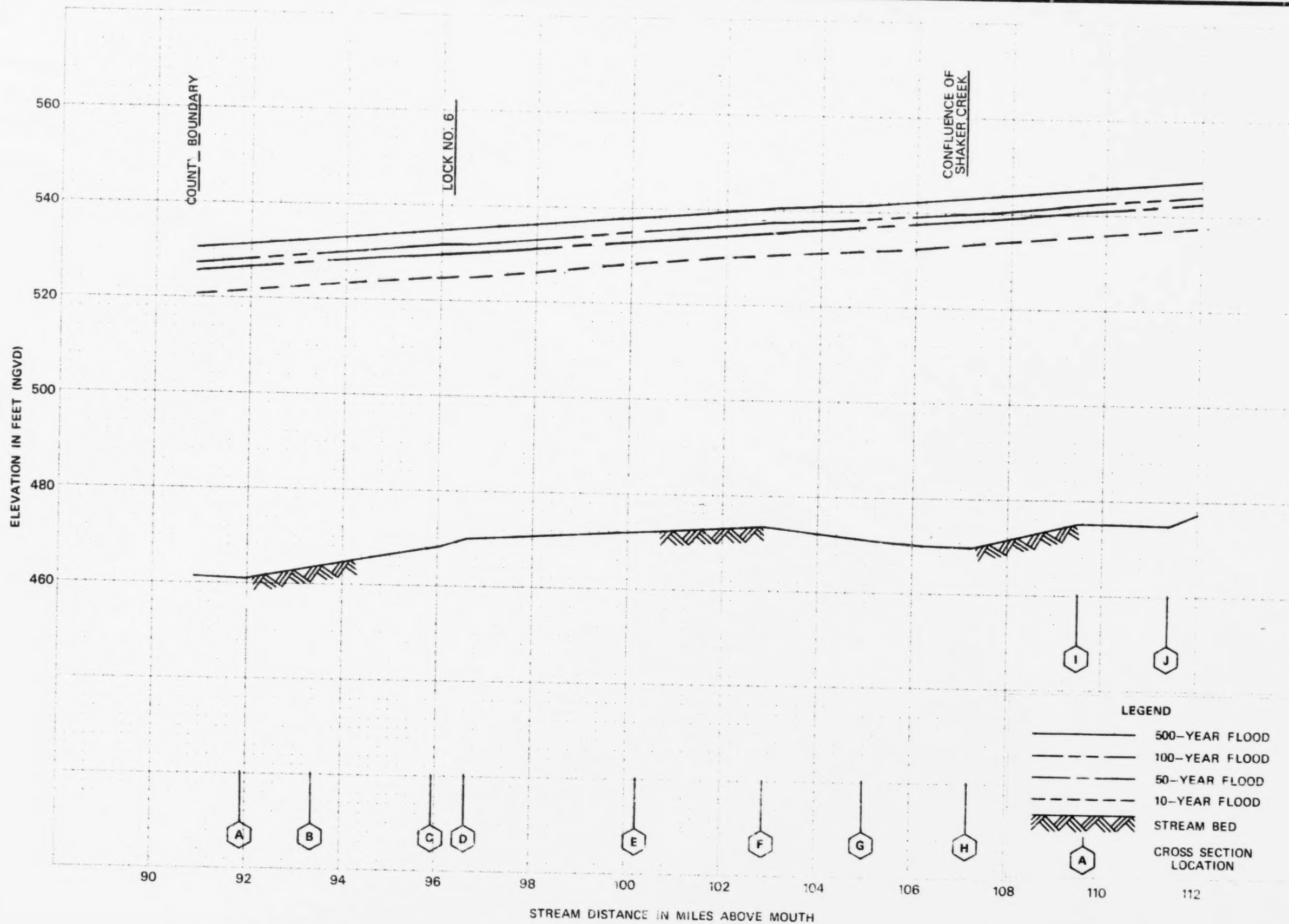
9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Housing and Urban Development, Federal Insurance Administration Flood Insurance Study, Woodford County, Unincorporated Areas, Kentucky, June 1978.
2. -----, Federal Insurance Administration, Flood Insurance Study, Jessamine County, Unincorporated Areas, Kentucky, August 1978.
3. -----, Federal Insurance Administration, Flood Hazard Boundary Map, Mercer County, Unincorporated Areas, Kentucky, November 1977.
4. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Kentucky, Washington, D.C., February 1982.
5. U.S. Geological Survey, Water Resources Investigations Report 76-62, Techniques for Estimating Magnitude and Frequency of Floods in Kentucky, C.H. Hannum, 1976.
6. -----, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 20 Feet: Cornishville, Kentucky, 1952.
7. -----, Open-File Report 81-61, Drainage Areas of Streams at Selected Locations in Kentucky, D.E. Bower and W.H. Jackson, 1981.

8. U.S. Department of the Interior, Geological Survey, Water Supply Paper 1676, Magnitude and Frequency of Floods in the United States, Part 3B, Cumberland and Tennessee River Basins, P.R. Speer and C.R. Gamble, Washington, D.C., 1964.
9. U.S. Geological Survey, Water Supply Paper 1849, Roughness Characteristics of Natural Channels, H.H. Barnes, Jr., 1967.
10. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, April 1984.
11. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA/RD-86/108, Bridge Waterways Analysis Model: Research Report, J.O. Shearman, W.H. Kirby, V.R. Snyder, and H.N. Flippo, July 1986.
12. Federal Emergency Management Agency, Flood Insurance Rate Map, City of Burgin, Mercer County, Kentucky, August 1986.
13. ———, Flood Insurance Rate Map, City of Harrodsburg, Mercer County, Kentucky, August 1986.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0055	715.55	chiseled square on southeast corner of State Route 1941 bridge over the Chaplin River, about 17 feet northwest of road centerline
2	0055	731.30	chiseled square on top of walkway on northwest end of Cornishville Road bridge over the Chaplin River, 15 feet northeast of road centerline
3	0055	732.53	chiseled square on southwest end of concrete walk of Baptist Church at intersection of State Route 1941 and Cornishville Road
4	0055	730.71	railroad spike set in telephone pole located about 0.6 mile southeast along Cornishville Road from intersection with State Route 1941, 4 feet north of culvert entrance
5	0050	507.33	bronze disk on land wall at lower end of Lock 6 gaging station on the Kentucky River
6	0050	537.44	standard tablet stamped "53 RC 1950 537," set in concrete post on east bank of the Kentucky River at Mundy's Landing, 3 feet south and 3 feet west of short fenceline



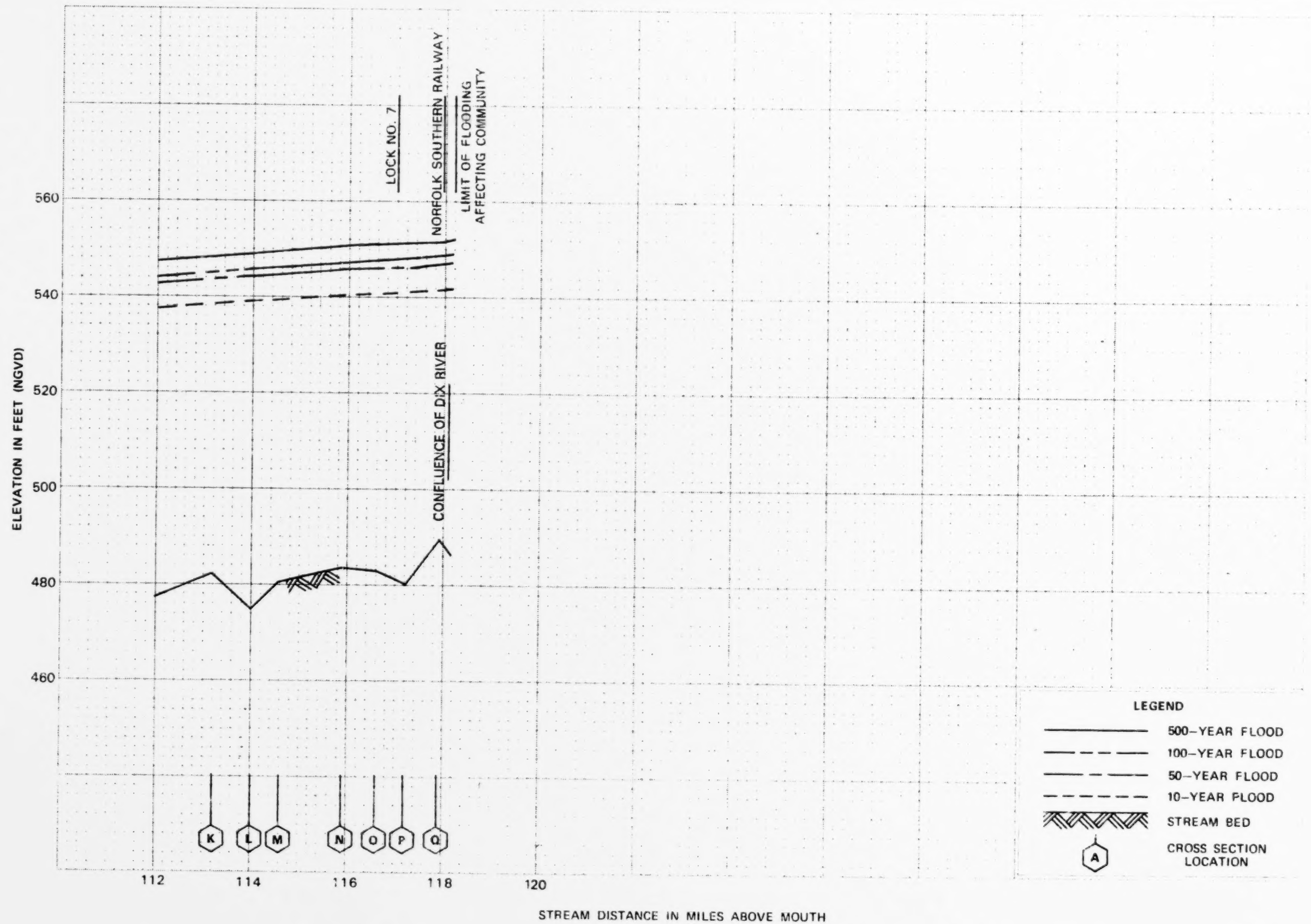
FEDERAL EMERGENCY MANAGEMENT AGENCY

MERCER COUNTY, KY
(UNINCORPORATED AREAS)

FLOOD PROFILES

KENTUCKY RIVER

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FLOOD PROFILES

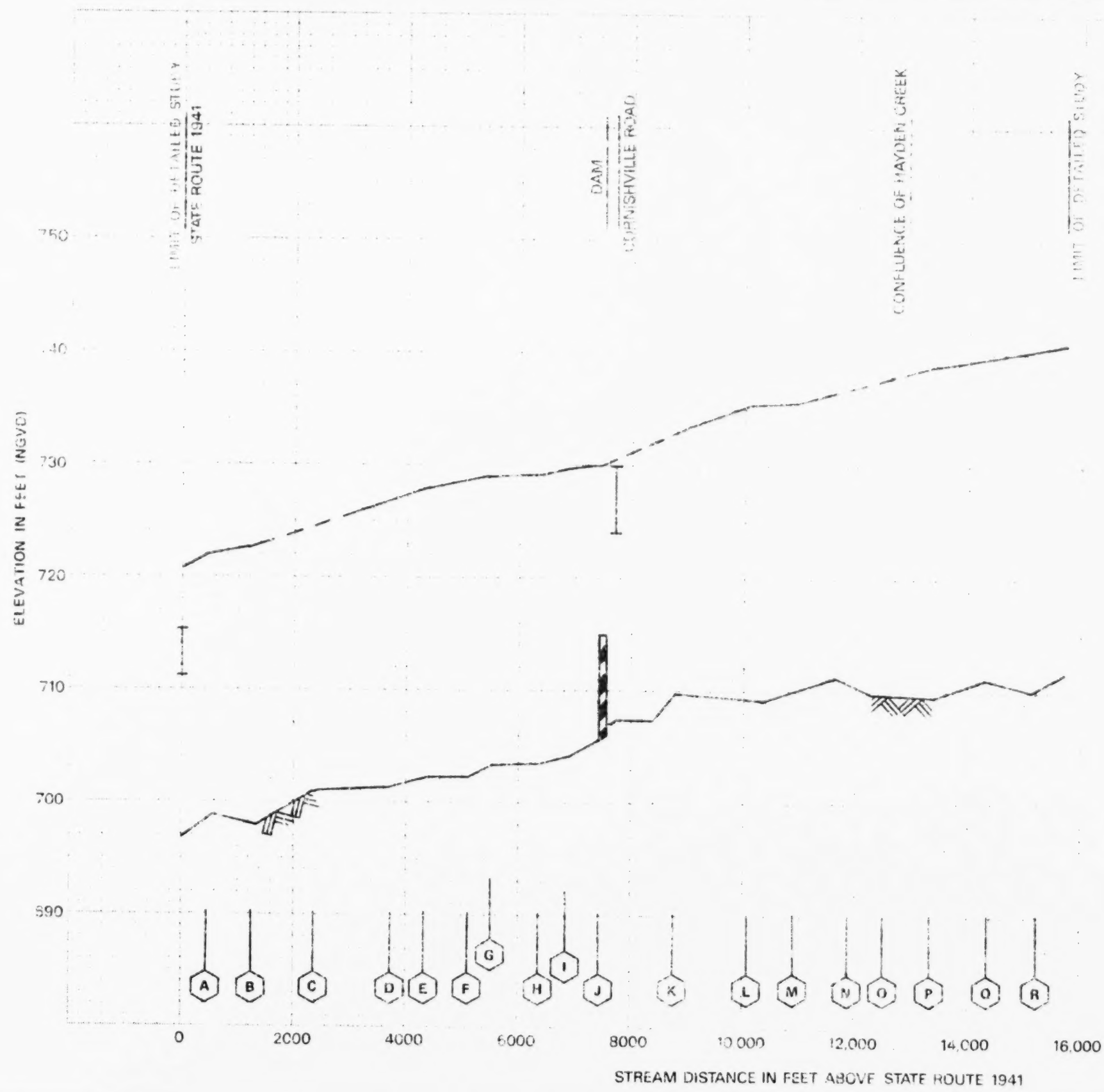
KENTUCKY RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MERCER COUNTY, KY

(UNINCORPORATED AREAS)

14



FLOOD PROFILES

CHAPLIN RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

MERCER COUNTY, KY

(UNINCORPORATED AREAS)